

Carbon Nanotube-based Supercapacitor, Phase I

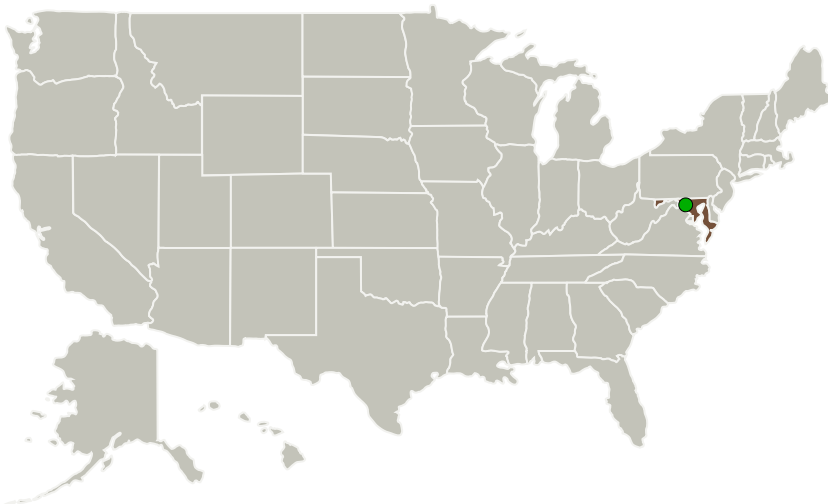
Completed Technology Project (2012 - 2012)



Project Introduction

To address NASA Goddard Space Flight Center's need for improved cost-effective, low mass and low volume devices or methods to store electrical energy onboard long duration (100-day mission) balloon flights at mid-latitudes and altitudes of 30-40 km, Luminet, LLC, proposes to develop a new carbon nanotube-based supercapacitor (CANS) with our mature chemical solution deposition (sol-gel) technology. This approach incorporates new CNT-sol-gel based electrode materials and alignment of CNT in the sol-gel, which enables us to meet NASA requirements for cost-effective, low mass and low volume, 28 V DC and 100 watt to 1000 watt power level. CANS offers very high power and energy, millions of charge/discharge cycles, rapid charge and discharge times, high efficiencies (98%), and cycle life >15 years, and functions at extreme temperatures. In Phase I, Luminet will demonstrate the feasibility of CANS by fabricating unpackaged prototype CNT-sol-gel based supercapacitors and comparing their performance to that of commercially available rechargeable batteries, which will reduce development risk in Phase II. In Phase II Luminet plans to continue the research and development of the CANS fabrication process, optimization of electrode material, computer simulation to make a large supercapacitor using CANS (one CANS cell will provide 2.5 V to 3 V) to achieve NASA's requirements. The demonstrated results will offer NASA capabilities to provide power storage. CANS is currently at TRL #2 at the beginning, by the end of Phase I it is estimated that it will have reached TRL #3.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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| Organizations Performing Work | Role | Type | Location |
|-------------------------------------|-------------------------|-------------|---------------------|
| ● Goddard Space Flight Center(GSFC) | Supporting Organization | NASA Center | Greenbelt, Maryland |

Primary U.S. Work Locations

Maryland

Project Transitions

▶ **February 2012:** Project Start

✓ **August 2012:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/138028>)

Project Management

Program Director:

Jason L Kessler

Program Manager:

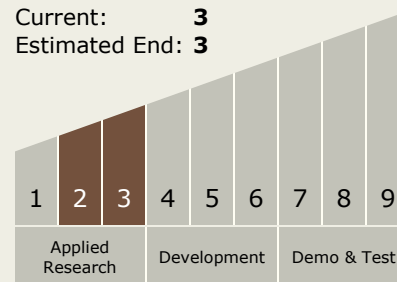
Carlos Torrez

Principal Investigator:

Jun Ai

Technology Maturity (TRL)

Start: 2
Current: 3
Estimated End: 3



Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - TX12.1 Materials
 - TX12.1.6 Materials for Electrical Power Generation, Energy Storage, Power Distribution and Electrical Machines

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Target Destinations

The Sun, Earth, The Moon,
Mars, Others Inside the Solar
System, Outside the Solar
System